Fall 2018

TRAN 650-851: Urban Systems Engineering

Lazar Spasovic

TRAN 650 URBAN SYSTEMS ENGINEERING Fall 2018

Section 851

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OFFICE HOURS: Via e-mail with a maximum response time of 48 hrs.

LECTURES: Distance Learning posted on Wednesdays

COURSE DESCRIPTION

The course introduces the basic quantitative methods that underline modern urban systems engineering and management science analysis. The basic theory of these methods will be described along with a strong emphasis on the practical applications of these methods. This latter objective is accomplished through the use of various software packages and case studies. In particular, the concept of mathematical programming, stochastic processes, queuing theory, and modern decision analysis will be presented and applied to a variety of problems arising in transportation, civil engineering, and engineering management.

REQUIRED BACKGROUND

Undergraduate Courses in Probability and Statistics, Mathematical Analysis for Technology, and Personal Computers (see Graduate Catalog).

REQUIRED TEXT

Wayne L. Winston, "Operations Research: Applications and Algorithms", 4th edition, Duxbury Press, Belmont, California.

HOMEWORK ASSIGNMENTS

There will be six homework assignments following the lectures. The homework assignments must be performed independently by each student. Students will submit the homework solutions in NJIT Moodle. The due date for each homework assignment will be a week after the homework posting in the Moodle (the submission due date and time will be indicated in the Moodle).

CASE STUDIES

Four case studies will be assigned. The class will be divided in groups of 3-4 students and each group will solve the case studies independently. Case study solutions will be due two weeks after the assigned date. Each group will submit a single case study solution. The cover page will list the names of all students in the group. The solution can be submitted either in a report format (MS Word or PDF), or a presentation format (PowerPoint or PDF slides).

CLASS PARTICIPATION

Students are encouraged to participate in online discussions using the forums in Moodle. The instructor will create forums for each weekly module. The students should post questions related to lectures or assignments in the forums. The instructor may invite the class to discuss a particular question or problem and students are encouraged to take part in the discussion.

EXAMS

There will be a midterm and a final exam. Each exam will be assigned through Moodle and students will have one week to solve the problems and submit the solutions. The submission will be through Moodle.

GRADING:	Case Studies	15%
	Homework	15%
	Midterm Exam	30%
	Final Exam	30%
	Class Participation	10%

TENTATIVE SCHEDULE OF CLASSES

WEEK	TOPIC	ASSIGNED READING
1	Introduction Linear Programming	Chapters 1-3
2	Graphical Method for LP/Review of Linear Algebra/Simplex Method	HW #1 Assigned
3	Simplex Method/Revised Simplex Method Highway Ramp Metering	Chapter 4 HW #2 Assigned
4	Duality Theory/Sensitivity Analysis	Chapters 5-6 Case Study #1 Assigned
5	Network Models Conrail Empty Rail Car Repositioning	Chapters 7-8
6	Network Simplex/Transportation Applications	Chapter 8 HW #3 Assigned Case Study #1 Due
7	Integer Programming Traveling Salesman Problem	Chapter 9 Case Study #2 Assigned
8	Midterm Exam	
9	Nonlinear Programming	Chapter 12 HW #4 Assigned Case Study #2 Due
10	Review of Basic Probability Theory	Chapter 11 Case Study #3 Assigned
11	Stochastic Processes Queuing Theory and Application Toll Plaza Operation	Chapter 22 HW #5 Assigned
12	Statistics, Forecasting, Regression Analysis	Chapter 24 (Section 6) Case Study #4 Assigned Case Study #3 Due
13	Decision Analysis	Chapters 13-14 HW #6 Assigned
14	Transportation/Civil/Management Applications Case Study 4 Presentations	Case Study #4 Due
15	Final Exam	